



**STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION**

DIVISION OF UNDERGROUND STORAGE TANKS

COMPLIANCE GUIDANCE DOCUMENT - 107

**EFFECTIVE DATE – July 29, 1996
(REVISION DATE – July 19, 1999)**

RE: REQUIREMENTS FOR STATISTICAL INVENTORY RECONCILIATION

The purpose of this guidance document is to assist the regulated community in understanding Tennessee's current policies for Statistical Inventory Reconciliation (SIR). Division policy recognizes monthly SIR as one of the "other methods" of monthly monitoring under *Rule 1200-1-15-.04 (3) (h)*. This rule states:

Other methods. Any other type of release detection method, or combination of methods, can be used if:

- 1. It can detect a 0.20 gallon per hour leak rate or a release of 150 gallons within a month with a probability of detection of 0.95 and a probability of false alarm of 0.05; or*
- 2. The Division may approve another method if the owner and operator can demonstrate that the method can detect a release as effective as any of the methods allowed in subparagraphs (c)-(h) of Rule 1200-1-15-.04 (3). In comparing methods, the Division shall consider the size of release that the method can detect and the frequency and reliability with which it can be detected. If the method is approved, the owner and operator must comply with any conditions imposed by the Division on its use to ensure the protection of human health and the environment.*

INTRODUCTION

Statistical inventory reconciliation analyzes inventory, delivery, and dispensing data collected over a period of time to determine if the Underground Storage Tank (UST) system (tank and associated product lines) is leaking. Each operating day, the UST owner/operator measures product level using a gauge stick or other tank level monitor. The owner/operator also keeps complete records of all withdrawals and all deliveries to the UST. After data has been collected for a specified period of time (not to exceed thirty (30) days), the owner/operator provides the data to the SIR vendor for processing. Computer software is used to conduct a statistical analysis of the data to determine if the UST system is leaking. Some SIR methods can report if dispensers are out of calibration, theft is occurring, or product deliveries are inaccurate.

The SIR vendor provides the owner/operator with monthly results showing the status of the UST system. The SIR vendor must sign an agreement with the Division and provide a copy of the signed agreement to the owner/operator. Once this agreement is received, the SIR vendor may be put on a list of Approved SIR Vendors. A list of all approved SIR methods and SIR vendors can be obtained from the Nashville Central Office.

REQUIREMENTS FOR STATISTICAL INVENTORY RECONCILIATION

A SIR method must be able to detect a leak of at least 0.2 gallon per hour. Also, the SIR method must have a probability of detection (Pd) of at least 95% with a probability of false alarm (Pfa) of no more than 5%. SIR methods are evaluated by third party evaluators to determine if their methods meet these criteria.

The SIR method may be **quantitative** or **qualitative**. A **quantitative** test reports results in terms of a numerical leak rate based on characteristics of the data set. A **qualitative** test reports results as pass or fail based on a comparison of data set characteristics with a predetermined threshold.

Tank owners using SIR must meet the following:

1. All requirements pertaining to inventory control in Rule 1200-1-15-.04(3)(a)1-6.
 1. Inventory volume measurements for petroleum inputs, withdrawals, and the amount still remaining in the tank are recorded each operating day. (An “operating day” is considered to be any day product is placed into or removed from the tank. All readings required for daily SIR data collection must be done each operating day.)
 2. The equipment used to take daily inventory readings is in good state of repair and is capable of measuring the level of petroleum over the full range of the tank's height to the nearest one-eighth of an inch;
 3. The petroleum inputs are reconciled with delivery receipts by measurement of the tank inventory volume before and after delivery;
 4. Deliveries are made through a drop tube that extends to within one foot of the tank bottom; (tank level measurements do not have to be made through the drop tube)
 5. Petroleum dispensing is metered and recorded within the local standards for meter calibration or an accuracy of 6 cubic inches for every 5 gallons of petroleum withdrawn;
 6. The measurement of any water level in the bottom of the tank is made to the nearest one-eighth of an inch at least once a month, recorded, and taken into consideration in the SIR determination of tank status.
2. All SIR methods and SIR vendors must be approved by the Division before the respective SIR can be used as a release detection method. All SIR vendors must sign an agreement to abide by the Division's policy concerning the use of SIR as a method of monthly monitoring in Tennessee. The Division requires that a copy of this agreement be given to the owner/operator and shall be maintained as long as services are provided by the SIR vendor.
3. Some SIR vendors make versions of their SIR program available as packaged software which may be operated by the tank owner on a personal computer. Such systems may be referred to as “stand alone” SIR systems. These systems are designed to conduct a SIR evaluation of the data entered by the tank owner without assistance by a SIR data analyst. If a tank owner purchases and operates such a SIR system, the following conditions apply:
 - a. The owner must complete a SIR agreement as referenced in item #2 of this page. This agreement shall be submitted to the Division Director along with a list of locations where this method is being used. It is expected that the “stand alone” SIR system will only be used on tanks that **they own**.

- b. If the owner/operator uses a stand alone SIR method on tanks which they do not own, they will be assuming the full obligations of a SIR vendor as outlined in this agreement and are fully expected to meet all responsibilities incumbent on SIR vendors outlined herein.
 - c. Users of stand alone SIR systems may not make modifications to the software or in any way alter the method used to make leak detection determinations. The users may only operate the system as designed and are precluded from doing anything that will alter the sensitivity of the method or affect the probability of detection of probability of false alarm. Any modifications or software upgrades must be done by the SIR method developer or owner or owners authorized representative.
4. A monthly report which consists of the inventory record used (raw data) plus the resulting SIR determination must be maintained by the owner/operator. The last twelve months of SIR results must be maintained for inspection.

REPORTING AND RECORDKEEPING

Inventory data must be analyzed at least every thirty (30) days to determine if the UST system is tight. When the owner/operator receives monthly test results from the SIR vendor, it is the owner/operator's responsibility to report any suspected releases to the Division within 72 hours of becoming aware of a suspected release.

Results of each SIR analysis must be determined with a probability of detection of at least 95% and a probability of false alarm of no more than 5% and reported as either (1) Pass, (2) Fail, or (3) Inconclusive. These categories are summarized below:

- (1) **PASS:** Means that the calculated leak rate **does not exceed** the predetermined value of 0.10 gallons per hour (gph) **and** the minimum detectable leak in the monthly data does not exceed 0.20 gallons per hour (gph). The number of valid daily readings must equal the number required for a valid result as certified in the Third Party evaluation for the method.
- (2) **FAIL:** Means that the calculated leak rate **exceeds** the predetermined value of 0.10 gph **and** the minimum detectable leak in the monthly data does not exceed 0.20 gallons per hour (gph). Any time the owner/operator receives notice of a "Fail" that fact **must** be reported to the Division within seventy-two (72) hours. Immediately upon receiving SIR "Fail" results or two (2) consecutive inconclusives, the following steps must be taken within a thirty (30) day time period:
 - a. Conduct an UST systems tightness test; If the test result is a "pass" and there is no environmental contamination present, no further action is required; or
 - b. Conduct an UST systems tightness test; If the test result is a "pass" and environmental contamination is present, a site check must also be performed; or
 - c. Conduct an UST systems tightness test; If the test result is a "fail", a site check must also be performed.
- (3) **INCONCLUSIVE:** An inconclusive generally indicates that the inventory records are too poor, have too much variability, or are of insufficient length such that the data could not be analyzed with reliable results. This result stands "as is" and can not be re-evaluated. The following results may be considered inconclusive:
 - a. A month in which the minimum detectable leak in the data exceeds 0.20 gallons per hour (gph).

- b. A month in which the calculated leak rate **exceeds** the predetermined value of 0.10 gallons per hour (gph) **and** the minimum detectable leak in the monthly data exceeds 0.20 (gph).
- c. A month in which the number of valid daily readings does not equal the number required for a valid monthly result as certified in the Third Party evaluation for the method.
- d. A month in which the SIR result is a “gain” or indicates a “gaining trend” that exceeds the predetermined value of 0.10 gph, and this result is not due to measurable water incursion, then this result may be considered an ‘inconclusive’ and treated as such. If the gain is due to measurable water incursion, then it must be reported as a ‘fail’ and the appropriate procedures followed.

If a monthly report indicates an Inconclusive result, the owner/operator shall immediately implement the SIR vendor’s procedure for investigating and determining the cause of the inconclusive. If the reason for the inconclusive is a physical problem, such as meter miscalibration, the tank owner can not re-evaluate the data set, but must immediately correct the physical problem. If the next **consecutive** month’s results are also inconclusive, the tank owner must report this to the Division within seventy-two (72) hours as a suspected release, and follow the procedures outlined in **(2) FAIL: under REPORTING AND RECORDKEEPING**.

SIR vendors must base monthly results on data analysis of daily inventory measurements and collected data. SIR vendors may not make monthly calls using the inventory control standard of 1% of monthly throughput plus 130 gallons. For instance, if a valid monthly SIR analysis indicates that the predetermined value of 0.10 gph is exceeded, the result must be a ‘fail’, regardless of the whether or not the inventory control standard of 1% of monthly throughput plus 130 gallons is exceeded. Tank owners may **not** rely on inventory control results while using SIR as their release detection method.

The tank owner is required to report the following conditions to the Division within 72 hours:

- a. Any SIR result which is a “Fail”, or
- b. Any second consecutive month in which a tank received an “Inconclusive” SIR result.

Failure to report a suspected release to the Division may result in enforcement action against the tank owner/operator.

All SIR results must be maintained and be made available to the Division during an inspection. The owner/operator should receive the SIR analysis no later than seven (7) business days after the end of the reporting period. The owner/operator must retain the last twelve months of leak detection results and, if applicable, the most recent line and/or tank tightness test results.

All purchasers of “**stand-alone**” SIR software systems are required to maintain documentation as required in 1200-1-15-.04(5)(a) which states: “All written performance claims pertaining to any release detection system used, and the manner in which these claims have been justified or tested by the manufacturer or installer, must be maintained for five (5) years from the date of installation”, meaning the beginning of the SIR system’s use by the purchaser. The stand-alone SIR owner/operator shall also retain a copy of the third party evaluation for the SIR method being used. The owner/operator using a SIR service must obtain a copy of the most current version of the agreement signed **by** the SIR vendor with the Division. SIR vendors are required to provide a copy of the signed agreement to the owner/operator and receive a signed receipt showing he has provided this. Owners/Operators of stand alone SIR software must agree to the additional terms on the last page of the Agreement and execute a copy of the signed agreement and return it to the Division Director.

The monthly SIR report must contain at a minimum the following information: location name and Tennessee UST Facility number; complete address of location; tank owner's name and phone number; name of SIR method and version used; name and address of SIR provider; and month being analyzed. For each individual tank the following information must be provided: tank number, size, and product; the minimum detectable leak rate and calculated leak rate for the data set (for quantitative methods); the number of days analyzed; a result that is either 'Pass', 'Fail', or 'Inconclusive'. The raw monthly data (product level measurements, volume conversions, reconciliation to book values, etc.) must be attached to or incorporated into the monthly SIR report.

LIMITATIONS AND/OR EXCLUSIONS

There are several items that must be considered before utilizing SIR as a release detection method. Please note the following:

1. SIR may be used on manifolded UST systems in Tennessee **without further evaluation** as long as the total capacity of the manifolded system does not exceed the capacity for which the method was approved. If the capacity of the manifolded system exceeds this size, SIR may be used as inventory control, but must be supplemented with additional monitoring methods to meet leak detection requirements. **If the Vendor has been evaluated with manifold data on a third party evaluation and listed on the List published by the National Work Group on Leak Detection Evaluations as having used the SIR Protocol addendum for manifold tanks, then the size limitations appearing on the List will apply for single and manifolded tanks.**
2. The size limitation for single tanks will be the size listed in the SIR evaluation on the List published by the National Work Group on Leak Detection Evaluations.
3. The State of Tennessee does not recognize SIR analyses as a substitute for a tightness test.
4. SIR is a test of that portion of the UST system **that** routinely contains product including the piping. SIR is not intended as a substitute for all required conditions for piping. All pressurized piping must also have mechanical or electronic line leak detectors in accordance with Rule 1200-1-15-.04(4)(a).
5. If the SIR vendor requires 90 days of data for initial evaluation, another method of monthly release detection must be conducted during that period.